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Nonlinear simulations of the m=0 instability development in z-pinch equilibria with axial sheared flows[1] IOANA PARASCHIV, BRUNO S. BAUER, IRVIN R. LINDEMUTH, VOLODYMYR MAKHIN, University of Nevada Reno — A detailed study of the linear and nonlinear development of the m=0 instability in the presence of sheared axial flows has been performed using a two-dimensional magnetohydrodynamic numerical code, MHRDR, to solve single-fluid ideal MHD equations. In order to accurately study the sheared flow effects on the z-pinch stability, the code was modified to include periodic boundary conditions and a monotonic van Leer advection algorithm. Linear growth rates obtained with MHRDR were in good agreement with the linear theory (<10% difference). Nonlinear mode coupling and saturation of the sausage instability have been studied for z-pinch equilibria with and without sheared flows. It was found that sheared flows changed the m=0 development by reducing the linear growth rates, decreasing the saturation amplitude, and modifying the instability spectrum. High spatial frequency modes were stabilized to small amplitudes, and only the long wavelengths continued to grow. Full stabilization was predicted for supersonic plasma flows.

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